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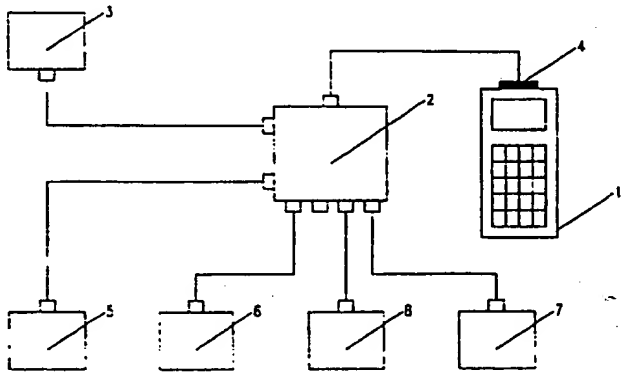

(57) Abstract

A method and a device is provided for dosing for instance manure, fertilizers, chemicals and/or seed grain in a field. According to the invention the field is divided into micro sections of for instance 10 x 10 m, and data on the quality of the soil are collected, such as temperature etc., and based on these data which are stored in a control unit (1), a supply unit (2) can control a per se known dosage unit (3) for automatic variation of the dosage so that this is correct for the particular micro section (11) in agreement with the measured and stored data. The invention also relates to a dosage device for carrying out the method, and this device comprises speed measuring means (5) for determination and division of the field section (10) into micro sections and recording means (6, 7, 8, 9) for measuring each micro section's direction and degree of inclination, content of micro nutrients and fertilizers, physical composition, acidity, temperature and yield of the soil.

* See back of page

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METHOD AND DEVICE FOR DOSING FOR INSTANCE FERTILIZERS, CHEMICALS AND/OR SEED GRAIN IN A FIELD

The invention relates to a method for dosing for instance manure, fertilizers, chemicals and/or seed grain in a field by means of a dosage device comprising a dosage unit, and a dosage device for carrying out the method.

Previously known methods of this type have endeavoured to provide as uniform a dosing as possible across an entire field from a fixed value given by the operator. Since most agricultural fields, however, differ in respect of acidity, physical composition, drainage condition, weed flora and degree of inclination of the soil, the need for supplying fertilizers and the like varies from one section to the other for obtaining an optimum yield.

In order to overcome this disadvantage different solutions have been offered.

A machine for spreading manure and fertilizers across a field is known from DE publication no. 35 39 669 in that the spreading can be increased depending on a pre-fixed spreading quantity per field unit, whereby the variation is obtained by the operator performing an adjustment of the speed of the spreading means.

A sowing machine as known from DE patent no. 32 17 010 and a seed spreader as known from DK patent application no. 4755/81 work according to a similar manual setting.

Since the mentioned variations often occur within only a few metres and the existing machines at least within a relatively large field area aim at a constant dosing, this means that areas of a particular field will be overdosed

causing waste, whereas other areas will be supplied with a quantity which is insufficient to obtain an optimum yield.

Consequently, it is the object of the invention to provide a method of dosing for instance manure, fertilizers, chemicals and/or seed grain where sections of the field are dosed individually as opposed to that which is the case with the prior art methods and devices, so as to obtain a maximum yield from these sections with as little waste as possible.

This object is obtained by a method of the initially described kind, the said method according to the invention being characteristic in that the field is divided into micro sections, that soil data are collected for each micro section, that these data are stored in a control unit, and that the stored data during dosing are used in a supply unit for automatic variation of the dosage from a dosage unit so that the dosage will be correct for the particular micro section.

This division into micro areas having such a small extent lengthwise and widthwise that they will substantially be covered by the outer dimensions of generally known dosage devices, causes the mentioned variations in the soil to be so small that they can be regarded as insignificant so that the single micro area can be regarded as having a uniform character and therefore can be homogeneously dosed.

The measuring results of the character of the soil in each micro area are transmitted to the control unit, and during the dosing process the control unit applies that part of the stored data which are necessary in order to be able automatically to vary the dose, so that this will always be correct for the micro section in question, and by connecting suitable measuring means it is possible during work in

the field to collect and store information about each micro area.

It should here be mentioned that a sowing machine is known from EP publication no. 0 191 287 having micro processors which store values collected during transport. The stored values can later be recalled, but with respect to this known sowing machine it is not data about the quality of the soil which are collected, but merely values which concern the sowing; consequently, this sowing machine does not provide the maximum yield of a field.

The method according to the invention, where each micro section is dosed individually as opposed to the prior art methods performing a substantially constant dosing across large parts of the field, permit a reduction of the total consumption of spread material per field, it makes production more economical, increases the output and lessens pollution caused by the spread manure, fertilizers and/or chemicals.

The division of the field into micro sections is preferably performed by measuring the speed of motion of the dosage device, upon which the extent of the micro areas in the direction of motion of the dosage device is determined based on the measured speed, while the extent of the micro areas across the direction of motion is determined by the width of the dosage device and/or by its transverse spreading range.

Lengthwise the size of the micro section is thus determined by means of a suitable short time interval, and across the width is determined by adjustment of the dosage device in a generally known manner.

Data for each micro section comprising the direction and

degree of inclination, content of micro nutrients and fertilizers, physical composition, acidity, temperature and yield of the soil are measured by means of measuring means for this purpose, such as measuring transducers which are arranged on a dosage device known per se together with a control unit designed to be able to store the measured data.

Based on the measured data which are stored in the control unit, a dosage unit is controlled to deliver a suitable quantity of material to the micro area.

It is expedient that the control unit can be removed by means of a plug connection, whereby it can be moved to another dosage device which will then be able to dose the field on the basis of the measured data.

This embodiment permits such a device as is merely provided with a control unit and measuring means to be moved across a field in order to collect the required data. The control unit can then be moved to a dosage device which is not provided with measuring means but merely with a dosage unit which can use the mentioned data making it possible with this dosage device to traverse the field a second time in the same pattern of motion for dosing of the material to be spread.

If the dosage device can only spread one material at a time, it may be necessary to drive across the field several times in the same pattern of motion in case more than one particular material is to be distributed.

The method and device according to the invention will be explained in further detail in the following with reference to the drawing, in which:

Fig. 1 is a schematic view of the means contained in a dosage device according to the invention when the device is used for collecting data as well as for dosing at least one particular material,

fig. 2 shows a device according to the invention in an embodiment where it merely collects data, and

fig. 3 shows an example of the division of a field into micro sections.

The dosage device shown schematically in fig. 1 comprising a per se known dosage unit 3 is provided with a control unit 1. The control unit 1 is designed to be able to store data in a known manner which are transmitted to the control unit through a plug connection 4 and so as to be able to once again transmit data through the plug connection 4. It should be emphasized that the expression "transmit data" should be taken to mean both to transmit a copy of the stored data so that the data remain stored, and to transmit data so as to empty the store. Which of the two possibilities is used will depend on circumstances.

The dosage device according to the invention moreover has a supply unit 2 which partly is connected to the control unit 1 by the plug connection 4, and partly with different measuring means 5, 6, 7, 8 and 9.

Of these measuring means, which may be in the form of measuring transducers, the measuring means 5 is designed to be able to monitor the speed of motion of the dosage device across the field which is to be dosed by a material such as manure, fertilizers, chemicals and/or seed grain.

When this speed has been passed to the control unit through the supply unit 2 and the plug connection 4, the control

unit is able to divide the field 10 into smaller area units or micro sections 11 by measuring suitable time intervals. In the direction of motion of the dosage device these sections may have a length of for instance 10 m. Across the direction of motion the width is determined by the width of the dosage device, meaning the total width of the device with jibs which partly carries others of the mentioned measuring means, and partly is provided with means for supplying the dosed material to the soil.

Such an extent across the direction of motion may also be 10 m, whereby each micro section 11 measures 10 x 10 m, cf. fig. 3.

Other measuring means may be a means 6 for measuring the temperature of the soil, a means 7 for measuring the direction and degree of inclination of the micro section, a means 8 for recording the fuel consumption and finally a means or yield meter 9 for measuring the yield of the micro section 11.

When the dosage device according to fig. 1 has traversed the field 10 in a pre-determined pattern of motion, this field 10 will be divided into certain micro sections 11, and data on each micro section 11 will be stored in the control unit 1.

During the passage of the dosage device across the field 10, the dosage unit 3 could simultaneously have delivered the material to be dosed over the micro sections, but it is also possible to perform the dosing by a subsequent traversing of the field area 10 if only the previous pattern of motion is followed, since data on each micro section 11 remain stored in the control unit 1.

It will also be possible to collect data by means of the

embodiment of a device according to the invention as shown schematically in fig. 2. Once these data are stored in the control unit 1, this may be removed by means of the plug connection 4 and moved to another dosage device which only has a supply unit 2 and a dosage unit 3, and be connected to this dosage device also by means of the plug connection 4. It is then possible to dose the field 10 with a correct dose for each micro section 11, if only the field section 10 is traversed in the previous pattern of motion.

C L A I M S

1. A method for dosing for instance manure, fertilizers, chemicals and/or seed grain in a field by means of a dosage device comprising a dosage unit, c h a r a c t e r i z e d in that the field (10) is divided into micro sections (11), that soil data are collected for each micro section (11), that these data are stored in a control unit (1), and that the stored data during dosing are used in a supply unit (2) for automatic variation of the dosage from a dosage unit (3) so that the dosage will be correct for the particular micro section (11).

2. A method according to claim 1, c h a r a c t e r i z e d in that the speed of the dosage device is measured and the extent of the micro areas (11) in the direction of motion of the dosage device is determined based on the measured speed, while the extent of the micro areas (11) across the direction of motion is determined by the width of the dosage device and/or by its transverse spreading range.

3. A method according to claims 1 and 2, c h a r a c - t e r i z e d in that data are collected for each micro section (11) containing the direction and degree of inclination, content of micro nutrients and fertilizers, physical composition, acidity, temperature and yield of the soil.

4. A method according to claims 1-3, c h a r a c t e - r i z e d in that a detachable control unit (1) is used.

5. A dosage device for carrying out the method according to claim 1 for dosing for instance manure, fertilizers, chemicals and/or seed grain in a field by means of a dosage unit (3), c h a r a c t e r i z e d in that the device has speed measuring means (5) for measuring its speed of motion

and division of the field (10) into micro sections (11), recording means (6, 7, 8, 9) for collecting data about the soil for each micro section (11), a control unit (1) designed to be able to store the data, a supply unit (2) designed to be able to control the dosage unit (3) for automatic variation of the dosage in order for this to be correct for the particular micro area (11) depending on the data stored in the control unit (1).

6. A device according to claim 5, c h a r a c t e r i z e d in that the recording means comprise means for measuring for each micro section (11) the direction and degree of inclination (7), content of micro nutrients and fertilizers, physical composition of the soil, acidity, temperature (6) and yield (9).

7. A device according to claims 5-6, c h a r a c t e r i z e d in that the control unit (1) is connected to the dosage device by means of a plug connection (4).

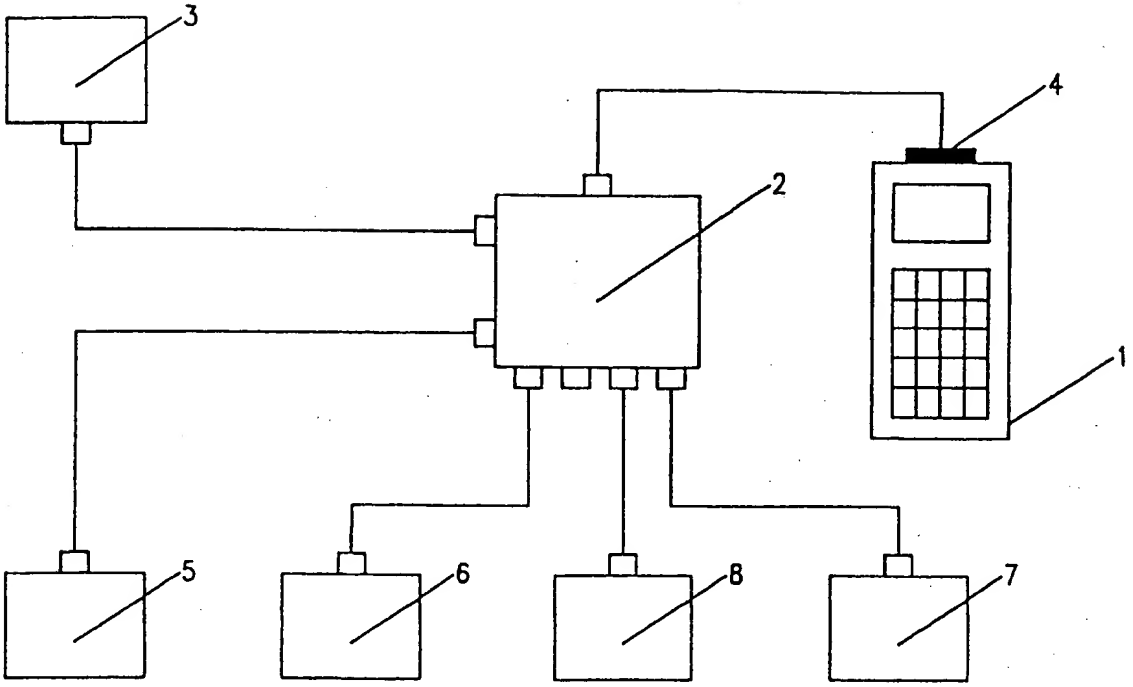

Fig. 1

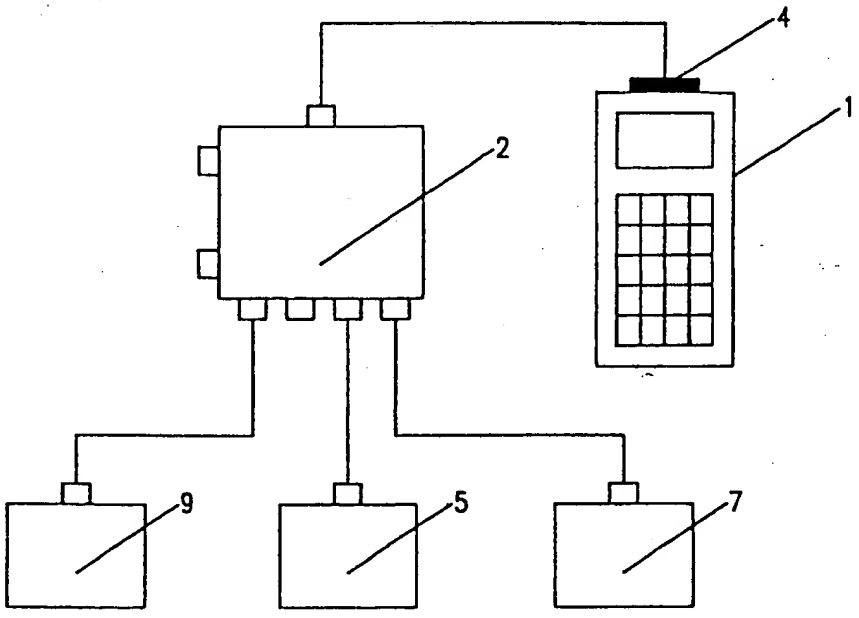

Fig. 2

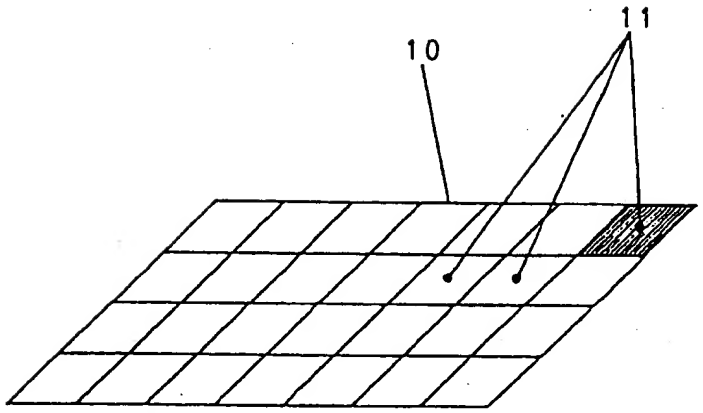

Fig. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 89/00200

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 01 B 79/02, A 01 C 7/10, 15/00, 21/00

II. FIELDS SEARCHED

Minimum Documentation Searched

Classification System	Classification Symbols
IPC5	A 01 B; A 01 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
Y	WO, A1, 86/05353 (DRONNINGBORG MASKINFABRIK A/S) 25 September 1986, see page 1, line 1 - page 2, line 10; page 10 - page 11 claims 18-31	1-7
Y	EP, A1, 0181308 (SOIL TEQ. INC.) 14 May 1986, see claim 1	1-7
Y	EP, A1, 0191287 (AMAZONEN-WERKE H. DREYER GMBH & CO. KG) 20 August 1986, see page 3, line 28 - line 35	4,7
Y	US, A, 4015366 (HALL, III) 5 April 1977, see column 15, line 34 - column 17, line 62; abstract	3,6

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15th March 1990	1990 -03- 21
International Searching Authority: SWEDISH PATENT OFFICE	Signature of Authorized Officer: Åsa Fransson

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ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 89/00200

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A1- 86/05353	86-09-25	NONE		
EP-A1- 0181308	86-05-14	AU-B-	574981	88-07-14
		AU-D-	4939085	86-05-15
		US-A-	4630773	86-12-23
EP-A1- 0191287	86-08-20	DE-A-	3500885	86-07-17
US-A- 4015366	77-04-05	US-E-	RE31023	82-09-07